=10*A1:C5 and confirm this entry using the key combination *Ctrl+Shift+Enter*. The result is a 3 x 5 array in which the individual values in the cell range (A1:C5) are multiplied by a factor of 10.

In addition to multiplication, you can also use other operators on the reference range (an array). With Calc, you can add (+), subtract (-), multiply (*), divide (/), use exponents (^), concatenation (&) and comparisons (=, <>, <, >, <=, >=). The operators can be used on each individual value in the cell range and return the result as an array if the array formula was entered.

Comparison operators in an array formula treat empty cells in the same way as in a normal formula, that is, either as zero or as an empty string. For example, if cells A1 and A2 are empty the array formulas {=A1:A2=""} and {=A1:A2=0} will both return a 1 column 2 row array of cells containing TRUE.

When do you use array formulas?

Use array formulas if you have to repeat calculations using different values. If you decide to change the calculation method later, you only have to update the array formula. To add an array formula, select the entire array range and then make the required change to the array formula.

Arrays are an essential tool for carrying out complex calculations, because you can have several cell ranges included in your calculations. Calc has different math functions for arrays, such as the MMULT function for multiplying two arrays.

Creating array formulas

If you create an array formula using the Function Wizard, you must mark the **Array** check box each time so that the results are returned in an array (Figure 233). Otherwise, only the value in the upper-left cell of the array being calculated is returned.

If you enter the array formula directly into the cell, you must use the key combination *Shift+Ctrl+Enter* instead of the *Enter* key. Only then does the formula become an array formula.

> ✅ **Note**
>
> Array formulas appear in braces (curly brackets) in Calc. You cannot create array formulas by manually entering the braces.

> ✅ **Note**
>
> The cells in a results array are automatically protected against changes. However, you can edit or copy the array formula by selecting the entire array cell range.

Strategies for creating formulas and functions

Formulas that do more than a simple calculation or summation of rows or columns of values usually take a number of arguments. For example, consider the following equation:

$$x = x_i + v_i t + \frac{1}{2} a t^2$$

This equation models the position of an object undergoing linear, translational motion, with constant acceleration. The position (x) depends on time (t), and the equation also contains constant values for initial position (xi), initial velocity (vi), and acceleration (a).

For ease of presentation, it is good practice to set up a spreadsheet in a manner similar to that shown in Figure 237. In this example, the individual variables are input into cells on the sheet and no editing of the formula is required.